MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2022/2023

PTM0145 - TRIGONOMETRY

(Foundation in Information Technology)

5 OCTOBER 2023
9.00 a.m. – 11.00 a.m.
2 hours

INSTRUCTIONS TO STUDENT

1. Answer **all FIVE** questions. Each question carries equal marks and the distribution of the marks is given.
2. Write your name and student ID on every sheet of papers that you are going to submit.
3. All necessary working steps **MUST** be shown. **Answer All Questions.**

Question 1 [10 marks]

Complex number z and w are given by $z=-1-i$ and $w=1+i\sqrt{3}$.

a. Express z and w in polar form. (6 marks)

b. Hence, find the polar form of zw and $\frac{z}{w}$. (4 marks)

Question 2 [10 marks]

a. Find the equation in standard form of the parabola that has vertex $(-4,1)$, has its axis of symmetry parallel to the y-axis, and passes through the point $(-2,2)$. (4 marks)

b. The general equation of a circle is $x^2+y^2+4x-8y+13=0$.

i. Obtain the standard form of the equation of the circle. (2 marks)

ii. Find the center and radius of the circle. (2 marks)

iii. Sketch the circle and indicate its center. (2 marks)

Question 3 [10 marks]

a. If $\sin A=\frac{5}{6}$ and $\cos B=\frac{2}{7}$, where $\frac{\pi}{2}\le A\le\pi$ and $-\frac{\pi}{2}\le B\le 0$, find the exact value of

i. $\sin(A-B)$ (2 marks)

ii. $\tan 2A$ (2 marks)

b. Solve the following equation for $0\le x\le 2\pi$:

i. $3\sin x-4+\csc x=0$ (3 marks)

ii. $\sin^2 x+2\sin x+1=4\cos^2 x$ (3 marks)

Continued...

Question 4 [10 marks]

a. Establish the identity: $\dfrac{1-\cos 2x}{\sin 2x} = \tan x$ (3 marks)

b. Solve the triangle ABC if $a = 19$, $b = 16$ and $c = 11$. Find the area of ABC. (7 marks)

Question 5 [10 marks]

a. If $M = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 2 & 1 \\ 0 & -3 & 6 \end{bmatrix}$ and $N = \begin{bmatrix} 0 & -2 & 1 \\ 5 & 6 & 3 \\ 2 & -4 & 1 \end{bmatrix}$. Find $3M - 2N$.

(3 marks)

b. Solve the following system of linear equations using Cramer Rule.

$$x - 2y + z = 0$$
$$2x + y - 3z = 5$$
$$4x - 7y + z = -1$$

(7 marks)

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APPENDIX

Trigonometry Identities

$$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\sin 2A = 2\sin A\cos A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\sin A\cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)]$$
$$\cos A\cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)]$$
$$\sin A\sin B = \frac{1}{2}[\cos(A-B) - \cos(A+B)]$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

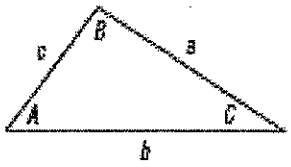
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2} \qquad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \qquad \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \qquad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}} \qquad \tan\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$$

$$\tan\frac{A}{2}=\frac{1-\cos A}{\sin A}=\frac{\sin A}{1+\cos A}$$

Triangles



Law of Sines:

$$\frac{\sin A}{a}=\frac{\sin B}{b}=\frac{\sin C}{c}$$

Law of Cosines:

$$c^2=a^2+b^2-2ab\cos C$$
$$b^2=a^2+c^2-2ac\cos B$$
$$a^2=b^2+c^2-2bc\cos A$$

Area of a Triangle: $A=\frac{1}{2}ab\sin C=\frac{1}{2}bc\sin A=\frac{1}{2}ac\sin B$

$$A=\sqrt{s(s-a)(s-b)(s-c)} \quad \text{where} \quad s=\frac{1}{2}(a+b+c)$$

Polar Coordinates

$$x=r\cos\theta$$
$$y=r\sin\theta$$
$$r=\sqrt{x^2+y^2}$$
$$\tan\theta=\frac{y}{x}$$